



Letters to the Editor

Complications and risk factors after digital subtraction angiography: 1-year single-center study

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TO THE EDITOR

We read with great interest the outstanding recent work entitled “Complications and risk factors after digital subtraction angiography: 1-year single-center study” published by Nam et al.⁴⁾ Non-invasive imaging modalities have replaced catheter based digital subtraction angiography (DSA) for many clinical indications, but DSA remains necessary for optimal preoperative planning of cerebral vascular pathologies, and serves as a key component of standardized follow-up protocols employed for certain diseases.⁶⁾ Though the benefits of the dynamic nature of this imaging modality and its superior spatial resolution are useful for neurosurgeons and neuro-interventionalists alike, a small but noteworthy number of DSA examinations lead to devastating complications.²⁾³⁾ The conclusion regarding DSA carrying a noteworthy risk of clinical complications reached by Nam et al. is appropriate and timely given the frequent use of this modality. We firmly agree with their principal conclusion, and believe their risk factor analysis warrants additional discussion in the context of various subgroups, indications, and clinical scenarios.⁴⁾

In their cohort that includes both adults and children, the authors find that longer procedures and the presence of malignancy are predictors of neurological complications, while longer procedures, anticoagulant therapy, femoral access, alcohol use, and male sex are predictors of access site complications. The overall complication rate was 5%, while neurological complications occurred in approximately 1% of cases. These complication rates are in line with findings reported in the adult and pediatric literature alike.²⁾³⁾

Neurological complications, whether hemorrhagic or ischemic in nature, are the most dreaded complication associated with DSA. The 1% rate of neurologic complications found by Nam et al. is lower than the historic rate cited in the largest series to date of 2.6%, perhaps reflecting improved techniques and technologies implemented in modern DSA.²⁾ In our center’s experience, which was focused specifically on pediatric DSA, 0.2% of patients had permanent neurological deficit, reflecting one child who had a stroke after microwire-induced injury during the procedure.³⁾ This lower

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rate may reflect the lower burden of vascular comorbidities that may promote procedure-related thromboembolism. Importantly, this particular patient was severely affected by their stroke, and given their young age, experienced many disability years as a consequence. Therefore, we agree strongly with Nam et al.'s conclusion regarding neurological complications across all patient groups. Interestingly in our pediatric experience, we found that female patients experienced complications at a higher rate, contradicting the finding of male patients experiencing access site complications at a higher rate in the present cohort. Nam et al. postulate that this may be due to men who are more likely to drink being more active following procedures. An analogous mechanism for our findings in pediatric female patients remains elusive.

Another essential finding in the present work is the higher rate of wound complications in patients that underwent trans-femoral access for their DSA study. There has been a recent push towards transradial access for diagnostic and interventional procedures due to easier access site control.^{1,5)} In line with Sun et al. identifying procedures lasting over 15 minutes as associated with more complications, the mean time for a four-vessel DSA with transradial access is 12 minutes, suggesting that such a practice is technically feasible.¹⁾ While these findings are promising, we believe this should be implemented cautiously rather than implemented in all patients. First, patient selection may have influenced studies that have suggested that transradial access is superior to femoral access. Secondly, transradial access carries its own set of unique complications. The radial artery has an elevated concentration of alpha-1 receptors, leading to an increased risk of vasospasm during the procedure, increasing both technical difficulty and complication risk.⁵⁾ To reduce the likelihood of radial artery vasospasm, intra-arterial cocktails comprising heparin, nitroglycerin, and verapamil may be administered.⁵⁾ In more severe cases, complications such as radial perforation, occlusion, pseudoaneurysm, or arteriovenous fistula may occur. Therefore, we support a gradual implementation of this technique

rather than a radical shift.

One area that the authors did not discuss is intraoperative angiography. This is routinely utilized by some centers, but is falling out of favor at others. It would be interesting if the authors have the data on intraoperative angiography safety given the changed conditions in which the angiographer must perform the study. It also must be considered that certain complications would not be distinguishable between surgery-induced and DSA-induced.

We congratulate the authors on their strong series. We hope that future work in this area considers points made in this article as we all collaborate to make DSA safer and more efficacious for our patients.

Keywords Angiography, Safety, Endovascular, Diagnostic

REFERENCES

1. Brunet MC, Chen SH, Sur S, McCarthy DJ, Snelling B, Yavagal DR, et al. Distal transradial access in the anatomical snuffbox for diagnostic cerebral angiography. *J Neurointerv Surg.* 2019 Jul;11(7):710-3.
2. Kaufmann TJ, Huston J 3rd, Mandrekar JN, Schleck CD, Thielen KR, Kallmes DF. Complications of diagnostic cerebral angiography: Evaluation of 19,826 consecutive patients. *Radiology.* 2007 Jun;243(3):812-9.
3. Lauzier DC, Osbun JW, Chatterjee AR, Moran CJ, Kansagra AP. Safety of pediatric cerebral angiography. *J Neurosurg Pediatr.* 2021 Nov:1-8.
4. Nam HH, Jang DK, Cho BR. Complications and risk factors after digital subtraction angiography: 1-year single-center study. *J Cerebrovasc Endovasc Neurosurg.* 2022 Dec;24(4):335-40.
5. Narsinh KH, Mirza MH, Caton MT Jr, Baker A, Winkler E, Higashida RT, et al. Radial artery access for neuroendovascular procedures: Safety review and complications. *J Neurointerv Surg.* 2021 Dec;13(12):1132-8.
6. Shaban S, Huasen B, Haridas A, Killingsworth M, Worthington J, Jabbour P, et al. Digital subtraction angiography in cerebrovascular disease: Current practice and perspectives on diagnosis, acute treatment and prognosis. *Acta Neurol Belg.* 2022 Jun;122(3):763-80.